

The Sampler

PROTECTING NEW HAMPSHIRE'S LAKES THROUGH THE DEDICATION OF VOLUNTEERS
PUBLISHED BY THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES
VOLUNTEER LAKE ASSESSMENT PROGRAM, SPRING 2005

VLAP Celebrates 20 Years of Monitoring New Hampshire's Lakes and Ponds

by Andrea LaMoreaux, DES VLAP Coordinator

The New Hampshire Volunteer Lake Assessment Program (VLAP) was initiated in 1985 in response to an expressed desire of lake residents to be involved in lake protection and watershed management. With over 900 lakes and ponds and only 10 DES biologists, it was evident that the only way to gather trend data from lakes and ponds was through trained volunteers. Mountainview Lake in Sunapee was the first lake monitored through VLAP and it is still actively monitored. Participation in VLAP has increased steadily since the program began. During 2004, 154 lakes and ponds were monitored and approximately 500 volunteers participated in VLAP.



*Eleanor Thompson and
Dick Whynall,
Mountainview Lake, Sunapee*

Routine volunteer monitoring results in early detection of water quality changes, allowing DES to trace potential problems to their source before the quality of the lake or pond is severely impacted. Over time, baseline data are used to determine long-term trends in lake water quality (refer to VLAP Trends article on page 5). These data are invaluable, in serving as a community planning resource, in maintaining federal lakes funding, and in DES's mission to protect New Hampshire's lakes and ponds. If a negative water quality trend in a lake or pond is revealed through VLAP monitoring, then the waterbody and its watershed may be eligible for more intensive study through the New Hampshire Clean Lakes Program.

What have volunteer monitors accomplished?

While we could not possibly discuss each accomplishment that volunteer monitoring groups have been able to achieve through VLAP over the past twenty years, here are a few examples:

- Identified sources of point source and non-point source pollution to lakes and ponds and have worked with landowners, town officials, DES biologists, and the New Hampshire Department of Transportation to correct many of these problems.
- Identified sources of bacterial and phosphorus contamination to lakes and ponds from livestock activities. DES biologists have worked with landowners and the Department of Agriculture to correct many of these problems.
- Sponsored Interactive Lake Ecology programs for local school children.
- Identified new exotic aquatic plant infestations before whole-lake infestations occurred.

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Connor's Corner



by Jody Connor
DES Limnology Center
Director

Another major milestone will be set this summer for VLAP and those dedicated volunteers who keep tabs on over 150 lakes and ponds in New Hampshire. It is hard to believe that this closely knit group of concerned lake residents and state biologists has stayed united in their efforts to protect our state's lakes and ponds for 20 years! Who knew that when I started this program in 1985 with just one lake association that together we would grow to approximately 500 volunteers monitoring 154 lakes throughout the state? Who knew that our hard work and efforts would lead to several state and national awards for excellence? Yes, VLAP has prospered over the years, but we have also had to endure some bad times together. We all remember those times when we lost program coordinators and had to cut budgets. Those were the times we all worked together with conviction to re-establish program elements which ultimately made the program stronger.

It is your strong commitment and dedication to VLAP that makes it work. It is all the wonderful people we have met and all the relationships that we have established that makes VLAP so special. It is all the data that you have collected that helps us assess the health of so many lakes and ponds. It is these assessments that help biologists make critical decisions about how to best manage

watersheds to protect surface water quality. These are the outcomes that make VLAP so effective in protecting and improving the quality of lakes throughout the state.

The New Limnology Center

After all these years of being cramped in one small laboratory, our dreams have finally come true! This spring, the DES Biology Section will move into our new Limnology Center. The new state-of-the-art center is much larger than our previous center, and it has a large window in the main corridor where you will be able to pick up and drop off equipment and samples. The new Center will make serving volunteer monitors and processing samples more efficient. Those of you who attend our annual VLAP workshop in May will be able to peruse our new headquarters.

What to Expect This Year

As many of you know, water quality and weather patterns are strongly correlated. The 2004 - 2005 winter season was relatively moderate in temperature; however, extensive snow and ice accumulations were present throughout the state. Most of the snow fell in February and March. The thick snow pack insulated the ice, which reduced ice thickness in most lakes, limiting the amount sunlight penetration into the water column to support photosynthesis and oxygen production. Consequently, many of the smaller ponds may have had low oxygen concentrations while farm ponds may have gone anoxic in late-winter.

Since ice thickness was thin to moderate, warmer March and April temperatures may lead to earlier ice outs. This will result in earlier lake mixing and earlier Spring Diatom Increase.

I anticipate that the large amount of surface runoff from the snowmelt and spring rainfall will generate significant amounts of phosphorus loading to surface waters throughout the state. Nearshore littoral zones (the area where rooted plants grow) will be less exposed due to the higher water levels. Aquatic plant growth may start later in the season than last year as sunlight penetration may be limited by the higher water level and increased turbidity in the water column. The expanded area of the littoral zone will likely result in less competition among the fish population for spawning grounds. If water temperatures remain cool during the spring, fish populations may experience a less stressful spawning season, which will result in a lower fish mortality rate.

Increased populations of green and golden-brown algae may occur in early July. Warm water temperatures in mid to late July may make filamentous green algae prevalent in many of the shallower waters of the state. I expect that cyanobacteria blooms will occur in some phosphorus-rich lakes by August.

In Closing

Please remember to share your lake's annual VLAP report with your lake association and town or city officials. As we have observed in many watersheds, this data is valuable in helping planning and zoning boards to create local watershed ordinances to protect surface water quality from sedimentation and excessive phosphorus loading resulting from unplanned and piecemeal development.

Have a safe and enjoyable sampling season!

2004 Volunteer Limnologist Award Recipient

At the 2004 Annual Volunteer Lake Assessment Program (VLAP) workshop, DES initiated a tradition of recognizing one volunteer for his or her dedication and commitment for volunteer lake monitoring.

This award has been named the Volunteer Limnologist Award because each time a volunteer monitor collects a water sample from a lake or pond or conducts a Weed Watcher survey, the volunteer is performing the role of a true limnologist. Potential recipients of this award are evaluated based on their years of service collecting water samples through VLAP and surveying aquatic plants through the Weed Watchers Program. Potential recipients are also evaluated based on their involvement in educating their community about lake quality and watershed management issues.

The recipient of the 2004 Volunteer Limnologist Award was Joe Farrelly of Pleasant Lake in Deerfield. Joe has sampled Pleasant Lake through VLAP for many years and has helped coordinate and conduct weed watcher surveys. He was the driving force in having a nutrient loading and diagnostic fea-

sibility study conducted for the lake and he assisted DES biologists with sampling of the lake and its numerous tributaries for an 18-month period. As a result of this study, he is currently working with representatives of neighboring towns so that uniform zoning is implemented within the lake's watershed. In addition, he has also served on the New Hampshire Lakes Association Board of Directors.

Congratulations Joe!



Joe Farrelly (right) and Tony Spinazzola (left), Pleasant Lake, Deerfield

2005 Volunteer Limnologist Award Nominees!

The nominees for the 2005 Volunteer Limnologist Award are:

- **Leslie Enroth, Kezar Lake, Sutton**
- **Bob Compton, Deering Lake, Deering**
- **Bill Martin, Lake Mascoma, Enfield**
- **Baron Fryer, Pine River Pond, Wakefield**
- **The Webster Lake Association, Franklin**

Attend the Volunteer Lake Assessment Program Workshop on May 21, 2005, to see who will win this prestigious award!

Good luck to all of the nominees!

Volunteer Lake Assessment Program Recognized by Volunteer NH!

Volunteer Champion Award Recipient

The New Hampshire Department of Environmental Services' Volunteer Lake Assessment Program received the prestigious Volunteer Champion Award presented by Volunteer NH! on November 4, 2004, at the second annual Spirit of New Hampshire Awards banquet.

VLAP received the award for the exemplary support of volunteerism displayed by a state agency.

"I am extremely pleased that VLAP has been chosen to receive the Volunteer Champion Award. I think that it is a fitting recognition for all of the hours of work that the hundreds of volunteers donate to the state and in doing so allow DES to keep close track of the quality of our state's waterbodies," said Commissioner Michael Nolin.

Volunteer NH! is a non-profit statewide organization that promotes and supports volunteerism throughout New Hampshire.

"Volunteer Champion Awards" are given to entities that provide the ongoing support and structure for volunteers to be successful. These categories include non-profits, faith-based organizations, service clubs, businesses, government, and education.

For more information regarding the Spirit of New Hampshire Awards, please visit their website at www.volunteernh.org.

Looking for Funding to Support Your Water Quality Monitoring Program?

by Andrea LaMoreaux, DES VLAP Coordinator

Unfortunately, as the cost of living continues to increase, it is likely that fees charged for sample analyses at the Colby-Sawyer/Lake Sunapee Protective Association Laboratory, as well as the DES Chemistry Laboratory, will increase in the future. Therefore, we would like to suggest the following ways in which your monitoring group might secure additional funding to support your water quality sampling program.

- Ask your town to dedicate funding to support water quality testing at your lake or pond. This can be done by proposing a warrant article in support of an annual water quality sampling budget at town meeting. Remember, a large percentage of the tax base in many towns comes from lake shore property; therefore, it is in the town's best

interest to support water quality monitoring and the protection of surface waters.

- If your monitoring group is not part of an official lake association, organize a group of concerned property owners around the lake to form a lake association. Lake associations can serve several functions including implementing membership dues which can be used towards paying for water quality sample analyses. (Refer to article below for more information.)

- If your monitoring group is part of an official lake association and currently relies on membership dues to subsidize your water quality sampling program, the association might want to consider slightly increasing membership dues. Remember that each property owner along

the lake or pond has a vested interest in protecting the quality of the lake or pond and its tributaries.

- Conduct an annual fundraiser to support your water quality testing program. Recently, monitoring groups participating in VLAP have designed and sold calendars and T-shirts to pay for water quality sample analyses.

- Ask local businesses to support your water quality monitoring program. Local businesses may want to donate money and/or equipment to your monitoring group for advertising and public relations purposes.

Is your Monitoring Group Part of a Formal Lake Association?

Lake associations serve several functions, including:

- Developing a partnership with lake neighbors.
- Gaining awareness of neighbors' lake interests.
- Developing a communications network for sharing lake news.
- Raising awareness of lake issues in the community.
- Launching fund raising events and applying for grants.
- Designing a long-range lake management plan.
- Acting as a support group for members.
- Gaining strength in numbers. The group's opinions and needs can be constructively represented to local government officials.
- Gathering information and presenting educational programs for members and those living near the lake.
- Conducting data collection on a broad range of lake concerns (water quality, development, lake use conflicts).
- Gaining a historical perspective from long-term residents.
- Networking with other lake associations.

For more information on forming a lake association, contact Jody Connor, DES Limnology Center Director, at (603) 271-3414 or jconnor@des.state.nh.us.



Lake Massasecum, Bradford

Did You Know?

A recent study conducted by the University of New Hampshire and the University of Maine indicated that a one-meter decrease in water clarity can lead to decreases in shoreline property values ranging from approximately 0.8 to 6 percent, on average, in New Hampshire.

VLAP Long-Term Water Quality Trends

by Kendra Gurney, DES Biology Section Intern

There's no question about it – New Hampshire's population is growing. In some parts of the state, new housing developments and shopping plazas seem to be popping up almost overnight. In many cases this growth seems to be concentrated around the shorelines of the state's lakes and ponds. With all the new lake front homes and converted seasonal camps, as well as increased beach use and boater traffic, one might assume that the quality of our lakes and ponds is quickly worsening. Happily, this is not necessarily the case, according to lake water quality data collected through the Volunteer Lake Assessment Program (VLAP) since the program began 20 years ago.

New Hampshire is home to over 900 lakes and ponds greater than 10 acres in size. Because of the number of lakes, DES biologists are only able to comprehensively survey each lake once every 15 years or so. While this survey data may show some changes in lake quality, it is difficult to determine the cause of these changes and whether or not they are significant. Luckily for New Hampshire, 154 lakes and ponds are presently monitored through VLAP by dedicated volunteers, on average, three times each summer. With this tremendous amount of data being collected it is possible for DES to track significant changes in the quality of the lakes monitored through VLAP.

VLAP has been in existence since 1985, and during the past 20 years, approximately one sixth of the state's fresh water bodies have been monitored. As

	Chlorophyll-a (86 Lakes)	Transparency (Secchi disk) (85 Lakes)	Phosphorus: Epilimnion (87 Lakes)	Phosphorus: Hypolimnion (88 Lakes)
Worsening	5%	9%	2%	7%
Stable	77%	82%	76%	69%
Improving	8%	8%	16%	8%
Variable	10%	1%	6%	16%

VLAP Long Term Water Quality Trends

(Based on lakes and ponds with 10 years of data collected through 2003)

of 2004, approximately 90 of these lakes have been sampled for at least 10 consecutive years. For these lakes, DES has been able to conduct formal statistical analyses to determine if significant changes in water quality have occurred since monitoring began.

While program coordinators were able to "eyeball" trend lines on graphs in the past, for many lakes there is now an adequate amount of data to determine significant changes in lake quality. Specifically, chlorophyll-a concentration, water transparency and phosphorus concentrations have been tracked to determine significant trends. With formal regression statistics, it is possible to determine statistically significant increases and decreases, as well as stable and variable trends for these parameters, giving these reported trends more credibility than a visual assessment or estimation. Due to the nature of the formal statistical regression it is necessary to have at least 10 *consecutive* years of data and even then, the more data the better. While only one sampling event per year is required, three or more is ideal to produce the most reliable analysis of lake quality trends. For a detailed explanation of how formal regression statistics are performed and how to interpret results, please review the appendix of your an-

nual VLAP report.

Overall, the use of formal regression statistics has enabled the VLAP program to determine what has been happening to the state's lake quality during the past 10-20 years. Despite the rapid population and development growth the state has experienced, VLAP lakes *generally* seem to be holding their own, at least with respect to chlorophyll, transparency, and phosphorus. Approximately 70 percent to 80 percent of lake deep spots included in the statistical analyses have remained statistically stable for chlorophyll-a, transparency and phosphorus for at least 10 years. In most cases, more lakes have showed improvements than decreases in these parameters.

While this may be surprising, New Hampshire's lakes and ponds have a lot going for them. Legislation limiting shoreline development, installation of new sewer and septic systems for converted camps and new homes, as well as updated road and lawn maintenance practices have all had a positive impact on lake quality. And undeniably, increased environmental awareness and responsible watershed management, as well as the hard work of volunteer monitors has been essential to keeping New Hampshire's waters healthy!

Exotic Aquatic Plants: The State of the Waters in 2005

by Amy P. Smagula, DES Exotic Species Program Coordinator

As our lakes and ponds start to warm up with the rising spring temperatures, we can soon expect to see little spikes of green emerge from the sandy and silty lake bottoms across the state. You may be watching this process with eagerness for the summer season to come, hoping to catch site of a darting fish, wiggling tadpole, shy turtle, or even a hungry dragonfly nymph amidst the newly forming bright carpet of green in the lake. Others of you may be watching this process with dread, wondering if one of those tender green shoots will turn out to be exotic milfoil, fanwort, or even worse, HYDRILLA!

Before you worry too much, it is important to know the current infestations we have in New Hampshire, where they are, and how close to you they may be.

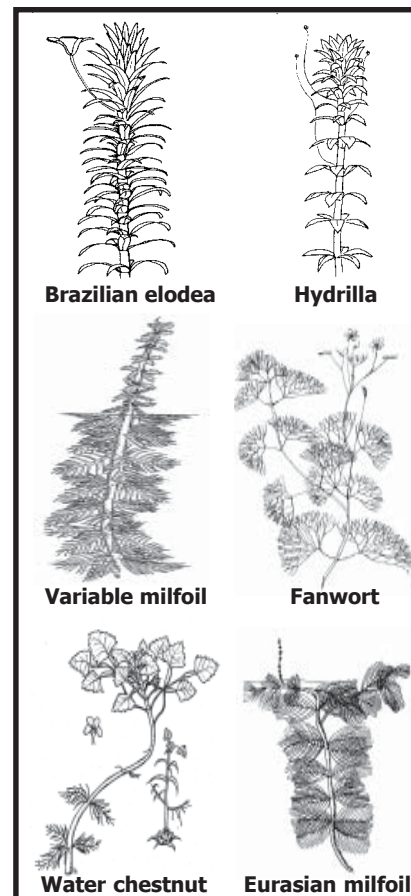
As of the 2004 fall season, New Hampshire had a total of 64 waterbodies that are host to growths of exotic aquatic plants. A map of the current distribution of these waterbodies can be found on the DES website at www.des.state.nh.us/wmb/exoticspecies/milfoil_list.jpg.

The following is a summary of the extent of each listed species in New Hampshire:

Variable milfoil is still, by far, the state's largest problem when it comes to exotic aquatic plants. Currently, 57 waterbodies have growths of this aggressive plant. In most cases, variable milfoil has come to dominate the shallow portions of these waterbodies, where a majority of the recreational activities take place.

Fanwort is the next most dominant species. This plant is now found in eight waterbodies. For several years, the number of fanwort sites was fairly static, holding steady at six waterbodies. In the last two years, two new waterbodies became infested with this plant (Otternic Pond in Hudson, and Lake Massabesic in Auburn). Most of the waterbodies that are affected by this plant are along Route 121 from Auburn to the Sandown and Derry area, which tells us that boaters who "lake-hop" in this area are likely spreading the plant. Interestingly, the fanwort in Lake Massabesic was first noticed directly adjacent to the boat launch area at Claire's Landing, telling us for sure that it was a boater who introduced the plant.

Water chestnut is currently in only one waterbody in New Hampshire (Nashua River), but as it is a northerly flowing river that connects into the Merrimack, another waterbody may eventually be added to the list. Water chestnut was first documented in the Nashua River in 1998, and it has remained isolated to this waterbody. Next door in Massachusetts though, water chestnut has been on the move as 14 new waterbodies have been infested in the last two years. As it is only the large woody seed of this plant that can cause new infestations rather than fragments like with other plants, many biologists believe that waterfowl and even possibly moose are the vectors for this plant's spread. Both of these water-loving creatures unwittingly move these seeds in their breast feathers and their fur to new waterbodies.



Brazilian elodea is still only found in one waterbody in New Hampshire, and that is Nutts Pond in Manchester. Believed to be a pet store or discarded aquarium introduction, this infestation was managed through an herbicide treatment in 2003, and is now under control. Fortunately, this waterbody is not used a lot by transient boaters, so the potential for this plant to spread is small; however, this waterbody does outlet eventually to the Merrimack River.

Eurasian milfoil is the other submersed aquatic plant listed in New Hampshire's waters. This plant, unlike its cousin variable milfoil, is not an aggressive colonizer in our

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waterbodies in New Hampshire, likely due to the acidic nature of our state's surface waters. Lake Mascoma and Mountain Pond are the only two lakes with this species of milfoil, but there are several sites along the New Hampshire banks of the Connecticut River that are infested with this exotic plant, particularly at the numerous public access sites along the river.

Now that you are aware of the current status of exotic plants in New Hampshire, you must still have many questions. Where will the next exotic plant crop up? What will it be? What impact will it have? Will it be in MY lake?

In many ways, a small degree of paranoia about this topic is actually a good thing! Many of the "saves" that we have had already in our state are due to the vigilance of concerned lake residents and volunteers like you. By systematically checking your lake and pond each year, particularly at the beginning and end of each growing season, you can do a lot towards finding new infestations early, and warding off full-lake infestations of problematic species.

If you are not already trained and participating in the Volunteer Weed Watcher Program, contact the Exotic Species Program Coordinator and ask about how to obtain training and materials. Information is available online at www.des.state.nh.us/wmb/exoticspecies, or can be obtained by contacting Amy Smagula at 603-271-2248 or asmagula@des.state.nh.us.



A Hedonic Analysis of the Effects of an Exotic Invader on New Hampshire Lakefront Properties

Amy P. Smagula, DES Exotic Species Program Coordinator

DES funded a study conducted by the University of New Hampshire, Resources Economics Department, to determine the economic impacts of variable milfoil to the lakes and ponds of New Hampshire.

The objective of the study was to estimate the impacts that milfoil has on lakefront property values. It was believed that through the reduction of aesthetic and recreational uses of the waterbodies, property values would in turn be reduced.

According to the UNH study, "This study applies the hedonic method to information gathered on observed property purchases on selected New Hampshire lakefronts. Once isolated, those observations are combined with information on the presence or absence of milfoil for the relevant lakes. Property price is then regressed against the independent variable, including the presence or absence of milfoil, to obtain the marginal prices of chief property characteristics ... home price, structural characteristics, locational charac-

teristics, and environmental characteristics (milfoil presence) were used."

The following lakes were analyzed in the study:

- Crystal Lake, Gilmanton
- Halfmoon Pond, Barnstead
- Lees Pond, Moultonborough
- Merrymeeting Lake, New Durham
- Squam Lake, Holderness
- Suncook Lake, Barnstead
- Lake Waukegan, New Hampton/Meredith
- Lake Wicwas, Meredith
- Lake Winnisquam, Belmont/Laconia
- Lake Winona, New Hampton

The results of the study indicate that the presence of milfoil on an average size lake of 2,036 acres would reduce individual property values by \$27,202.30, which, "for a lake with the average house selling at \$170,556.67, accounts for a decline of about 15.9 percent."

For more information regarding this study, contact Amy Smagula at (603) 271-2248 or asmagula@des.state.nh.us.

Attend the Annual Volunteer Lake Assessment Program Workshop!

The 2005 VLAP Annual Refresher Workshop will be held on Saturday, May 21, at DES in Concord.

Workshop participants will learn about the latest legislative and program updates, what a Watershed Ordinance is and how one can be established to protect your lake or pond, how to identify exotic aquatic plants, and how to conduct a watershed survey for non-point source pollution. Also, the recipient of the 2005 Volunteer Limnologist Award will be revealed!

If you would like to attend, please contact Andrea LaMoreaux, VLAP Coordinator, at (603) 271-2658 or at alamoreaux@des.state.nh.us.

DOT and DES Work Together to Protect Water Quality

by Andy Chapman, DES Biology Section Watershed Protection Specialist
and Jody Connor, DES Limnology Center Director

DES and the New Hampshire Department of Transportation (DOT) are now working cooperatively to protect the state's surface waters from sediment erosion, considered by many to be the leading non-point source pollutant during road construction projects.

The DOT and DES project goal is to improve long-term water quality by adhering to the state's water quality standards during DOT road construction projects and to quickly mitigate short-term best management practice (BMP) shortfalls. As part of the project, DOT's Bureau of Design will continue to work with DES' Wetlands Bureau. Projects that require additional water quality review receive further assistance from the DES Watershed Management Bureau at the request of the Wetlands Bureau. On-site interagency inspections are followed up by project meetings to discuss and revise construction plans in the beginning, rather than the end phase, of project design. Methods of stormwater infiltration within the upper reaches of a road project's watershed are being incorporated where possible. This helps to avoid end-of-pipe detention and treatment, unless site constraints deem it necessary.

In addition, short-term water quality impacts are being addressed. DOT currently has three projects located adjacent to lakes: Route 4A in Lebanon/Enfield (Mascoma Lake), Route 11 in Franklin/Andover (Webster Lake), and Route 3 in Belmont (Lake Winnisquam). Most of the stormwater runoff



Route 4A (left) in close proximity to Lake Mascoma (right)

in these areas discharges either to tributaries or directly to these lakes as surface sheet flow.

To minimize erosion on the construction sites and to avoid water quality impacts to surface waters, several protection measures are being employed. Before road and staging area construction begins, DES reviews and approves the DOT Storm Water Pollution Prevention Plan (SWPPP) or Erosion Control Plan (ECP). SWPPP improvements include: project phasing, stabilizing each project phase prior to advancing to the next phase, rainfall monitoring, routine and rain event turbidity monitoring, continuous turbidity monitoring, an emergency contacts list, and a list of on-site erosion control materials. Site specific erosion control improvements include: phasing cross-pipe, ditch line and road bed work, limiting open road bed near critical areas to 1,000 linear feet and other areas to 2,600 linear feet, and having all critical areas fully stabilized by Friday each week. The idea is to only expose as much substrate as necessary at any given time during a project, so that sediment erosion is minimized.

Each week, a construction meet-

ing with the DOT contract administrator and erosion control coordinator, project contractor, erosion control consultant, and DES Watershed Management Bureau is held on-site. The purpose of the meeting is to specify the project area within the current project phase and make any adjustments to the work area and schedule based on the contractor's needs and weather forecasts.

Lastly, the DOT has spearheaded an erosion control pilot project for Route 4A in Lebanon/Enfield along Mascoma Lake, by directly hiring the erosion control consultant. For all other projects, DOT hires a contractor who sub-contracts with an erosion control consultant. The erosion control consultant is responsible for communicating to DOT, the contractor, and DES the corrective actions necessary for erosion control deficiencies.

DES will continue to work with DOT to protect New Hampshire's surface waters.

If you have any questions about roadway construction projects contact Andy Chapman at (603) 271-5334 or achapman@des.state.nh.us.

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- Convinced town officials to set aside annual funding to support water quality sampling programs and exotic aquatic plant control and prevention projects.
- Worked with town officials to create watershed districts and watershed ordinances to protect surface water quality.
- Worked with town planning boards to require developers to conduct nutrient loading studies to determine the potential impact of proposed subdivisions on lake quality.
- Worked with town officials and DES to install sewer systems along shorelines.
- Reported incidences of algae and cyanobacteria blooms to DES.
- Reported violations of the Shoreland Protection Act to DES.
- Worked with state legislators to establish lake management related legislation, including recently supporting legislation which would formally establish the VLAP program and the Coordinator position in the operating structure of DES.

Thank you!

DES biologists are inspired by how much volunteer monitors are dedicated to improving and protecting the quality of lakes and ponds throughout the state.

To recognize volunteer monitors for their hard work and dedication, and to commemorate the twentieth anniversary of VLAP, DES has recently received a grant to produce a VLAP sign. Starting this spring, each VLAP monitoring group will re-

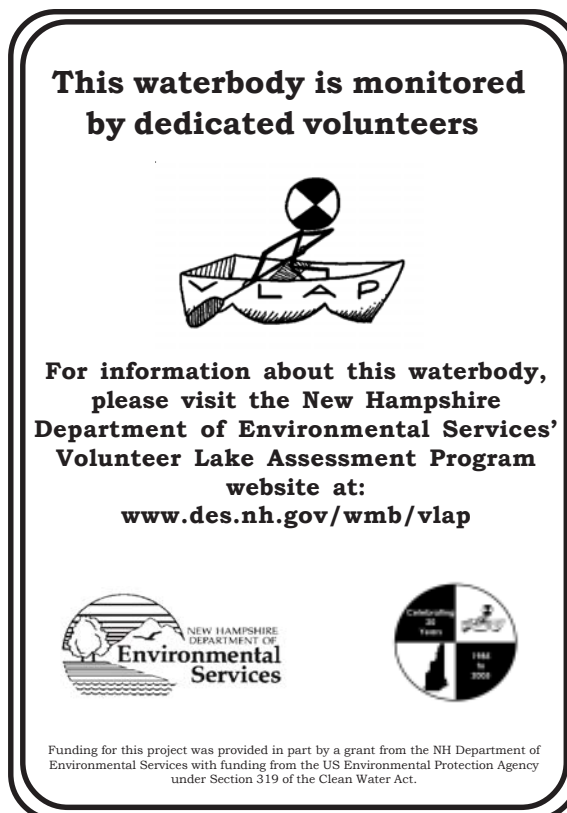
ceive at least one 12" by 18" aluminum sign to post at a public access point near their lake or pond. The sign will inform the public that the waterbody is monitored through VLAP and will provide the public with the address of the VLAP website should they wish to learn more about the waterbody as well as responsible stewardship of New Hampshire's surface waters. In addition, the public will be able to view the annual report for each participating lake or pond on the VLAP website. By informing the public that the lake or pond is monitored through VLAP, we hope that the public will act in an environmentally responsible manner while recreating to prevent any degradation to the waterbody.

DES will provide at least one sign to each participating volunteer group at the annual VLAP workshop held in May, when volun-

teer monitoring groups pick up sampling equipment at the laboratory, or will hand-deliver signs to each monitoring group during the annual biologist visit to each lake or pond. Volunteer groups are asked to provide the necessary supplies (posts, bolts, screws) and labor to post the sign near a public access point to their lake or pond. Please start thinking about where to post your sign!

Concluding Remarks

Regardless of an individual's or group's motivation for participating in VLAP — whether it is to improve community planning decisions, to do their part in protecting the local environment, or to protect their own investment in property adjacent to a lake or pond — the end result is the same: they play an integral role in protecting the quality of New Hampshire's lakes and ponds!



VLAP Twentieth Anniversary Sign
(on actual sign, the background color is blue and text and graphics are white)

Recreational Exposure to Cyanobacteria

by Sara Sumner, DES Beach Program Coordinator



Recent attention has been directed towards cyanobacteria in New Hampshire's lakes and ponds. In 2004, two public beaches experienced long-term cyanobacteria advisories, two others experienced short-term advisories and at least three lakes experienced lake-wide cyanobacteria blooms.

So what exactly are cyanobacteria? Cyanobacteria were formerly classified as blue-green algae. They are single celled organisms lacking a nuclear membrane that are capable of performing photosynthesis. Many are capable of converting atmospheric nitrogen into a biologically useable form of nitrogen. They are present in virtually all natural environments including many extreme environments, such as hot springs. Cyanobacteria may appear as single cells, colonies, or filaments.

Cyanobacteria commonly occur in nearly all of New Hampshire's waterways. When present in low numbers, they typically do not cause recreational or aes-

thetic problems. Cyanobacteria are able to regulate their buoyancy and depth in the water column allowing them to out-compete other algal species for sunlight. Their competitive nature combined with optimal nutrient loading to surface waters may cause bloom conditions. These blooms may turn the water a bright green (pea-soup) or bluish-green color. They may form a scum or film on the surface of the water. The scum may look like paint on the water's surface or may consist of chunks of cyanobacteria floating throughout the water column resembling paint chips. These blooms may cover an entire water body or be confined to a cove area. Blooms often congregate along the shoreline due to wind and wave action.

Whatever the case, cyanobacteria blooms are aesthetically unpleasing and potentially toxic to domestic animals, livestock, waterfowl, and humans. Many cyanobacteria produce toxins that may be released into the water upon cell lysis (destruction) or death. There are four

common cyanobacteria to New Hampshire's lakes and ponds that produce toxins. These toxins may be hepatotoxins (liver and kidney), neurotoxins (central nervous system) or dermatotoxins (skin irritants) capable of causing both acute and chronic illnesses. Acute effects, such as skin and mucous membrane irritations, can occur after short-term exposure with water containing these toxins. Chronic effects, such as liver, kidney, and central nervous system damage, can occur over a period of time from ingestion of water containing large amounts of toxins. Recreational exposure to cyanobacteria toxins is a major concern. Below is a list of common New Hampshire cyanobacteria, the toxins they produce, routes of exposure, and common side-effects.

If you suspect a cyanobacteria bloom is occurring at your lake or pond, please collect a sample (if possible) and call DES immediately at (603) 271-3414.

Genus	Common Toxins	Exposure	Side-Effects
<i>Anabaena</i>	Anatoxins (neurotoxin), Microcystins (hepatotoxin)	Swimming (skin contact and swallowing water), showering (if drawing water from lake), water sports, boating (aerosols from spray).	Nausea, vomiting, diarrhea, general malaise, severe thirst, skin and mucous membrane irritation, staggering, and paralysis.
<i>Aphanizomenon</i>	Saxitoxins (neurotoxin)	Swimming (skin contact and swallowing water), showering (if drawing water from lake), water sports, boating (aerosols from spray).	Numbness of lips and mouth extending throughout the body, motor weakness, respiratory and muscular paralysis.
<i>Microcystis</i>	Microcystins	Swimming (skin contact and swallowing water), showering (if drawing water from lake), water sports, boating (aerosols from spray).	Nausea, vomiting, diarrhea, general malaise, severe thirst, skin and mucous membrane irritation.
<i>Oscillatoria</i>	Anatoxins, Microcystins, Aplysiatoxins (dermatotoxin)	Swimming (skin contact and swallowing water), showering (if drawing water from lake), water sports, boating (aerosols from spray).	Nausea, vomiting, diarrhea, general malaise, skin and mucous membrane irritation.

Cyanobacteria Species of Concern in New Hampshire and Human Health Exposure Effects

Canada Geese Facts and Management Options

Canada Geese are a common sight around lakes, ponds and even golf courses. These birds often migrate in the fall, but isolated populations may reside year-round. Nesting begins in March and April, usually along a water body's riparian zone. Geese can lay approximately three to six eggs in a clutch, and often abandon the nest within one to two days. The geese can live upwards of 24 years and can weigh approximately 12 pounds.

How Much Nutrient Loading Do Canada Geese Add To A Lake?

One goose can consume up to four pounds of grass per day, creating about three pounds of fecal matter daily. In large concentrations, this matter can contribute to excessive nutrient loading because fecal matter contains 4.4 percent nitrogen, and 1.3 percent phosphorus. These nutrients can cause algal blooms and excessive plant growth in lakes.

How Can Canada Geese Affect Human Health?

When geese defecate near shore or in the water they create a health risk to humans. Their fecal material may contain the swimmers itch organism along with fecal bacteria. Swimmers itch is a temporary skin rash caused by a small parasite; however the rash does not require treatment. A larger concern are fecal bacteria, or *Escherichia coli* (*E. coli*), which are naturally oc-

curing bacteria in the digestive tracts of warm-blooded animals. *E. coli*, when present in large amounts, may cause gastrointestinal problems such as nausea, vomiting and diarrhea. The presence of *E. coli* may also indicate the potential presence of other pathogenic organisms. You should avoid contact and ingestion of water in areas frequented by geese.

How Do I Make My Property Less Inviting To Canada Geese?

You can employ some lake protection tips such as leaving a buffered zone near the lake comprised of bushes, shrubs and vegetation. Grass is very attractive and geese tend to flock to it. If you already have a grassy shoreline or lawn it is best to keep the grass high (6"). Remove accumulated nesting materials (sticks and shrubbery) prior to geese nesting, or remove the nest after geese have hatched and moved on (roughly two to three days after hatching). Remember however, before you tamper with the nests of Canada Geese, a permit is required from the U.S. Fish and Wildlife Service.

How Else Can I Manage Canada Geese on My Property?

- Create barriers between the grass and the water. The barrier can be as simple as a piece of string that they cannot



step over or walk under.

- Spray your lawn with methyl anthranilate; the chemical will give the grass an unpleasant taste making the grass undesirable to eat.
- Install an overhead grid wire to prevent the geese from landing and nesting in that area.
- Obstruct the view of the surrounding area. Geese need to identify if predators are approaching.
- Use noise harassment. If the geese land on the lake/property every morning greet them with a loud noise. There are several different tools you can use to create the noise harassment: propane canons, starter pistols, air horns, and recorded predator noises. (Let your neighbors know your plans - they may be harassed by the noise too!)
- Dogs may also deter geese from landing or roosting on your property. A barking dog guarding the property may be effective.
- For the best results, employ two or more of the management strategies.

This article was originally published as a DES Biology Section Fact Sheet (WD-BB-53). To read other lake biology related fact sheets visit www.des.nh.gov/bb.htm.



Earth and sky, woods and field,
lakes and rivers,
the mountains and the sea,
are excellent schoolmasters,
and teach some of us more than we
can ever learn from books.

John Lubbock, British Statesman
(1834 - 1913)

Limnologists In Training

by Alicia Carlson, DES Environmentalist

Limnologists have sampled many lakes and ponds throughout New Hampshire. When a limnologist collects water quality data, a determination about the health of the lake (whether it is clean, polluted, has many nutrients, etc.) can be made. Data can be analyzed and the quality of the lake can be classified. Most classification schemes rely on data for dissolved oxygen concentrations, plant and algae abundance, and water clarity.

Read the lake scenarios below. Classify each lake using the available data. Refer to the tables at the right side of the page to give each lake points based on the data. Once you have given points to the lake, identify its classification. Good luck! Answers are on page 14.

Crystal Lake: This lake is large and deep. It has a primarily forested watershed and few houses along the shoreline. There are few aquatic plants and they are found in only a few of the coves. As you (the limnologist!) take the dissolved oxygen reading, you discover it is 7 milligrams per liter (mg/L) within the bottom layer of the lake. There must be some trout living down in that oxygen-rich water! You drop the Secchi Disk into the water and you can see it until it reaches about 8 meters (m). You then collect an algae sample with your plankton net. You check under a microscope and see very few individual cells in the algae sample.

What do you think?

Total points: ____

Classification: _____

Mud Pond: This pond is shallow and full of aquatic plants. It is hard to steer your canoe through all of the plants emerging from the water. The dissolved oxygen reading near the bottom is 2 mg/L. Your Secchi Disk provides a reading of 1.5 m. As you collect the algae sample, you can see many small organisms floating in your jar. The microscope reveals a similar situation: the sample is full of algae!

What do you think?

Total points: ____

Classification: _____

Swan Lake: This lake has aquatic plants throughout its waters, but they are not bothersome to boats or swimmers. When you take the dissolved oxygen reading at the bottom of the lake, you find that it is 3.5 mg/L. Your Secchi Disk drops down to 5 meters before it disappears. In the lab, the microscope reveals algae throughout the sample, but the sample is not nearly as cluttered as the Mud Pond sample!

What do you think?

Total points: ____

Classification: _____

Classification	Points
Oligotrophic	0-5
Mesotrophic	6-11
Eutrophic	12-16

Data Category	Points
Dissolved Oxygen	
>4 mg/L	0
1 to 4 mg/L	2
<1 mg/L	4
Water Clarity (Secchi Disk)	
>5 meters	0
2-5 meters	2
<2 meters	4
Aquatic Plant Abundance	
scattered	0
common	2
abundant	4
Algae Abundance	
scattered	0
common	2
abundant	4

SOLUTION: On page 14

Lake Trivia: How much do you know about VLAP?



The answer to some of these questions can be found in this newsletter.

Q: What was the first lake monitored through VLAP?

A: Mountainview Lake, Sunapee, was first monitored in 1985 and is still monitored.

Q: How many lakes were monitored in VLAP during the summer of 2004?

A: 154

Q: What is the deepest lake monitored through VLAP?

A: Lake Winnisquam (173.8 feet)

Q: What was the northernmost lake monitored through VLAP in 2004?

A: Forest Lake, Whitefield.

Q: What VLAP monitoring group typically samples the most stations in a given year?

A: The Lake Sunapee Protective Association (LSPA). In 2004, LSPA sampled four deep spots, nine nearshore stations, and 35 tributary locations.

Q: How many individual sample results were generated through VLAP during 2004?

A: Approximately 12,461 individual sample results were generated. However, an entire dissolved oxygen/temperature profile, which includes many individual results, is counted as one individual result.

Q: Who won the 2004 Volunteer Limnologist Award?

A: Joe Farrelly, Pleasant Lake, Deerfield.

Small Outreach and Education Grant Programs Available

This program provides small grants of \$200 to \$2,000 for outreach and education projects (such as the VLAP sign project) relating to nonpoint source pollution (NPS) issues that target appropriate audiences with diverse NPS water quality related messages.

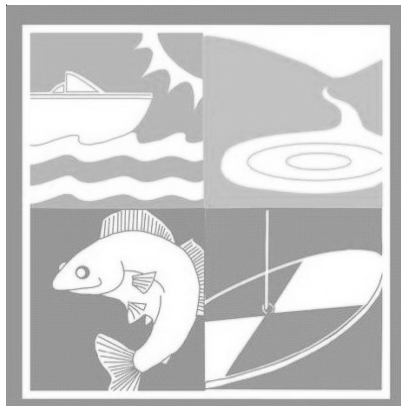
These small grants are available year-round on an ongoing basis, which allows applicants to move forward with outreach and education projects without having to wait for annual application deadlines.

The DES Watershed Assistance Section will administer the grant program using \$20,000 each year from the U.S. Environmental Protection Agency under Section 319 of the Clean Water Act.

For More Information:

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(603) 271-7889

Sponsor the Interactive Lake Ecology Curriculum



The Interactive Lake Ecology student and teachers' workbooks are available for purchase! The curriculum includes chapters on lake formation, water properties, the water cycle, the aquatic food chain, watersheds, pollution, non-native species, lake testing and classification. In addition, vocabulary exercises, experiments, and activities are included. While this curriculum was originally designed for middle school students, it can be adapted for older students and adults.

The student workbook costs \$5.50, while the teachers' reference is \$7.50. For information, contact Alicia Carlson at (603) 271-0698, or check out the ILE website at www.des.nh.gov/wmb/ILE.

Sampling Tip: How To Make Your Own Sampling Pole

Sampling the water at your lake or pond can be a relaxing and rewarding experience. However, occasionally you can be faced with a very frustrating, or even dangerous situation, if sampling sites are located in especially hard-to-reach areas. Often, tributaries flow in areas that are either obstructed by vegetation, surrounded by unstable and unsafe footing, or simply unpleasant to venture into. If you have ever been faced with one of these arduous sampling tasks, you may benefit from using a sampling pole!

Normally, to sample a tributary, a big white bottle is filled by scooping surface water from a flowing area of a stream. This requires the volunteer to crouch on the stream bank, or to step into the waters of the tributary. Ideally, this task should be relatively simple and safe. Often times, however, this can mean climbing down steep embankments, crawling on dam structures, or balancing on slippery rocks. In these cases, a sampling pole can be used to help reach appropriate sampling areas without putting oneself in a dangerous or unpleasant situation. A sampling pole simply acts as an extension of the sampler's arm, since the sampling bottle is attached to the end of the pole. Tributary water can then be scooped into the bottle from a much greater distance than if using the normal method.

If you often find yourself in precarious tributary sampling situations, DES suggests that you consider using a sampling pole to assist you during your monthly sampling events. This helpful tool can be bought; however, it is easy to construct and can make your sampling job a much more pleasant experience! Just follow these simple instructions, as adapted from the Massachusetts Department of Environmental Protection (MADEP).

Materials:

- Aluminum extension pole that extends 4' to 8' is recommended. Available in most hardware or home centers, usually used for window washing.
- One-handed C Clamp (quick release), which will hold a 3 ½" sample bottle
- 2 bolts
- 2 steel washers
- 2 neoprene washers
- Friction tape
- Waterproof glue
- Drill
- Screwdriver
- Pliers



*Biologist with sampling pole
Photo courtesy of MADEP*

Instructions:

1. If there is a threaded end on the aluminum pole, remove it (a drill should work).
2. Drill two holes through the end of the pole and the clamp handle, making sure to match them up so they can be connected. Be careful to drill your holes through the clamp handle **WITH-OUT** the release lever.
3. Attach the clamp to the pole using the nuts, bolts and washers. The neoprene washers should be in contact with the plastic clamp handle to prevent cracking as the bolts are tightened.
4. Add a drop of waterproof glue to the end of each nut (if you are not using lock washers).
5. Finish by adding friction tape to the inside of the clamp's jaws to prevent the bottle from slipping.

Sampling Tip
continued on page 15

LIMNOLOGISTS IN TRAINING SOLUTION (from page 12): Crystal Lake is Oligotrophic. Mud Pond is Eutrophic. Swan Lake is Mesotrophic.



2005 Legislative Updates



There are several bills that DES is following that relate to lakes. For the most up-to-date information, visit the New Hampshire General Court website at www.gencourt.state.nh.us/ie.

HB 317 Provides groups of 25 or more residents or property owners in a town the ability to petition the Department of Safety for required mooring permits. This bill is retained in the Resources, Recreation and Development (RR&D) Committee for further research.

HB 487 Officially establishes a Volunteer Lake Assessment Program and Volunteer Monitoring Coordinator in the Department of Environmental Services. This also allows grants and donations to be received by DES and designated for the VLAP program. This bill was heard in the RR&D Committee. This bill passed

the full House with an amendment and moves to the Senate.

HB 655 Increases the boat registration fee for public boat access and exotic aquatic plant control. This bill was killed by the RR&D Committee and no further action is expected.

HB 669 Updates the schedule of the analytical parameters and prices offered by the Department of Environmental Services Lab. If passed, this could mean that the cost of VLAP samples would increase. The costs for *E. coli* and phosphorus samples would increase from \$10 to \$20 and the cost for chloride would increase from \$10 to \$12. The bill is retained in committee.

SB 83 Establishes a commission to study issues relative to the Comprehensive Shoreland Protection Act. The commission will

review the law and will look for ways to make the law more effective and easier to interpret. This bill passed the full Senate with an amendment and is before the House RR&D Committee.

SB 103 Establishes an annual \$0.10 per linear foot of shoreland fee on waterbodies with state owned dams to provide the necessary funds for repairs and maintenance. This bill was referred to the Senate Environment and Wildlife Committee.

SB 128 Reduces mercury emissions from all coal burning sources to 50 pounds per year beginning July 1, 2009; with a further reduction of 24 pounds per year beginning July 1, 2013. This bill passed the senate with amendments and is now before the House Science, Technology and Energy Committee.

Sampling Tip: How To Make Your Own Sampling Pole (continued)

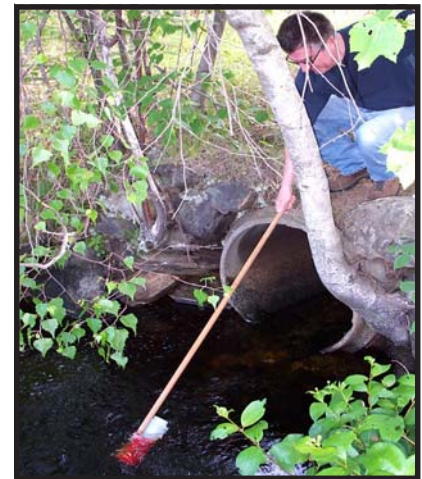
A cheaper and easier sampling pole can be made from items you may already have around your home. The following design comes from Rob Richtarek of Robinson Pond in Hudson.

Materials:

- Broom handle
- Coffee can (large enough to hold the big white bottle)
- 2 nuts
- 2 bolts
- 2 washers
- Drill
- Large rubber band

Instructions:

1. Drill 6-12 holes in the bottom of the coffee can (for drainage).
2. Drill two holes through the end of the broom handle and the side of the coffee can, making sure to match them up so the coffee can and broom handle can be connected.
3. Attach the coffee can to the broom handle using the nuts, bolts and washers.
4. Slide the rubber band over the broom handle and use it to secure the sampling bottle to the pole. When not in use the rubber band can be wrapped around the broom handle.
5. Velcro strips, string, or some other alternative to the rubber band may be used to secure the sampling bottle to the pole, so find something that works for you!



Rob Richtarek using the sampling pole he designed at Robinson Pond, Hudson.

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**Have you scheduled
your annual DES
biologist visit yet?**

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